

## ABSTRACT OF THE DISCLOSURE

A microfluidic affinity system is designed to recognize, capture and separate target analytes from input solutions. This microfluidic affinity system employs fluidic channels fabricated by silicon-based lithography in a silicon substrate. The fluidic channels are patterned and replicated in a substrate, preferably polydimethylsiloxane, PDMS, by pattern transfer from a silicon wafer mold with reversed patterns fabricated by lithography. A novel three-step covalent binding method for surface modification employs the following steps to covalently immobilize an affinity ligand on the substrate: 1) a plasma treatment; 2) a silanization treatment; and 3) a crosslinking treatment.